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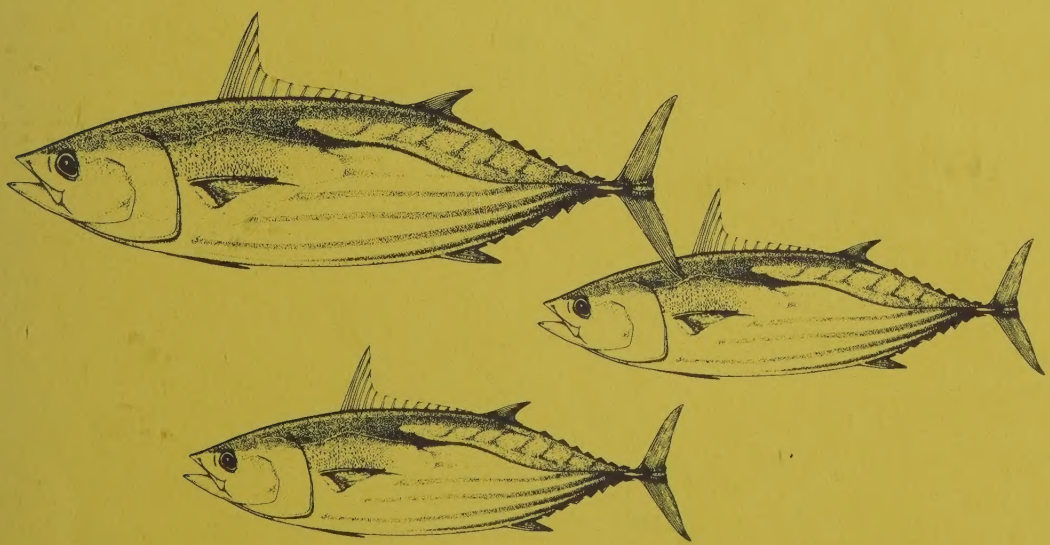
Fishing Information

MAY 1975
No. 5

# FISHING INFORMATION

Southwest Fisheries Center-La Jolla, California



noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / NATIONAL MARINE FISHERIES SERVICE

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES CENTER
8604 LA JOLLA SHORES DRIVE - P. O. BOX 271
LA JOLLA, CALIFORNIA 92037

# FISHING INFORMATION

MAY 1975, No. 5

EDITOR: JAMES A. RENNER

B. J. Rothschild, Director, SOUTHWEST FISHERIES CENTER
I. Barrett, Deputy Director
R. Shomura, Director, Honolulu Laboratory
N. Abramson, Director, Tiburon Laboratory

# PREFACE

This publication, Fishing Information, appears monthly and contains 1) fishery advisory information, 2) a narrative description of pertinent surface temperature conditions, 3) charts of winds and pressures for the eastern North Pacific, 4) charts of sea surface temperature for the North Pacific and eastern tropical Pacific, and 5) charts of subsurface temperature structure in the eastern North Pacific.

A supplement to Fishing Information appears at 15-day intervals throughout the year. This is a chart of sea surface temperature (contoured at 2°F (1°C) intervals) from Baja California to Vancouver Island out to about 135°W. Special bulletins are published in conjunction with the 15-day sea surface temperature charts which include short-term projections of albacore distribution and locations of productive fishing areas, information on oceanographic and atmospheric conditions, and other information as is appropriate during the albacore fishing season.

The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this publication approved by the Office of Management and Budget, August 20, 1973; this approval expires June 1976.

Submitted for publication - June 19, 1975

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ENVIRONMENTAL CHARTS ANALYZED BY:

F. Miller (Figures 8 and 9)
J. Renner (Figures 1,2,3,4,5,6,7,10 and 15-day Supplement)

TECHNICAL EDITOR:
R. Allen
CARTOGRAPHY:
R. Allen, H. Orr

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Pacific Environmental Institute, Fisheries Research Board of Canada, West Vancouver, British Columbia, by L. F. Giovando from observations by T. Carr at Langara Island Light; D. M. Short at Cape St. James Light; L. Collins at Kains Island Lightstation; I. G. McNeil at Amphitrite Point Light
Scripps Institution of Oceanography, La Jolla, California
Fishing Vessels, Aquarius, Bettie M., Bold Contender, Cabrillo, Captain Joe Medina, Carol S., Carol Virginia, Cheryl Marie, Frances Ann, Gina Karen, Jeanette C., Jo Linda, Kathleen, Kerri M., Larry Roe, Lois Seaver, Lucky Strike, Marco Polo, Maria C. J., Maria Elena, Marietta, Mary Barbara, Mermaid, Pan Pacific, Pacific Queen, Polaris, Queen Mary, Raefello, San Juan (WI-7714), San Juan (WX-8016), Santa Rosa, Saratoga, Sea Treasure, United States, Venturous, Voyager.

Expendable bathythermograph and salinity observations are made by the mates and engineers of the Californian of Matson Navigation Co. The data are processed under supervision of D. R. McLain at the NMFS Pacific Environmental Group, Monterey, using computer facilities of the Fleet Numerical Weather Center. The project is partially supported by the National Science Foundation and the Office of Naval Research under Government NAonr-9-74.

# Albacore Tuna Forecast for 1975

R. Michael Laurs and Staff
Albacore Fisheries Program
National Oceanic and Atmosperic Administration (NOAA)
National Marine Fisheries Service (NMFS)

This is the 15th annual advisory to be issued by the National Marine Fisheries Service for the albacore fishery off the North American Pacific coast.

It appears that catches of albacore off central and southern California should improve this season over what they have been for the past several years; however, the major portion of the commercial albacore catch this season is again expected to be taken north of San Francisco. It is estimated that as much as 60% of the total catch will be taken north of San Francisco, with most of the production from waters off the Pacific Northwest. Best fishing south of San Francisco should be from central California waters, but good fishing is expected off southern California southward to about Guadalupe Island early in the season. Good early season fishing is also expected in offshore waters between about 135° to 145° W and 33° to 36° N during June. If the ocean and atmospheric conditions persist into July, as we expect, there may be sizable concentrations of albacore 200 to 400 miles off central California during July. The outlook for albacore sports fishing off southern California is good.

The results of preseason scouting and the apparent early wind-up of the Japanese livebait fishery in the western Pacific indicate the possibility of an early arrival of fish this year in waters off the North American coast. However, strong oceanic frontal boundaries which are present in offshore waters and which, based on recent albacore research studies, appear to be important in determining the migration of albacore (presumably because of good feeding and optimal temperature conditions associated with them), could concentrate fish several hundred miles offshore and slow their movement into coastal waters.

The forecast of the general distribution of the albacore fishery is based on 1) a predictive index developed at the National Marine Fisheries Service (NMFS) La Jolla Laboratory which relates the north-south distribution of the fishery with oceanographic conditions in the spring months in certain offshore waters, 2) the structure of the boundary region between north and central Pacific waters, as inferred from subsurface temperature data taken between the U.S. west coast and Honolulu (this boundary region has been shown in the recent cooperative National Marine Fisheries Service-American Fishermen's Research Foundation (AFRF) albacore research studies to be important in influencing the migration patterns followed by albacore), and 3) the projected distribution of atmospheric pressure which should result in warming of ocean surface waters at a faster rate than normal, especially in the Pacific Northwest.

## RECENT TRENDS IN OCEANIC AND ATMOSPHERIC CONDITIONS

In the latter half of May and first half of June, sea surface temperature conditions were generally lower than normal, approximately 2°F, within a 200-mile band of the coast in most areas from Canada to Baja California due to retarded seasonal warming. In contrast, sea surface temperature conditions beyond 200 miles of the North American coast were near or above normal. Above normal temperatures, approximately 2°F, were found west of 140°W between 25° to 35°N. It is through this general region that albacore migrate to the North American coastal waters from the central Pacific.

Cooler than normal sea surface temperatures along the North American west coast and warmer than normal water further offshore in the lower-mid latitudes have persisted throughout the 1974-1975 winter. This pattern appears to be correlated with anomalous atmospheric pressure and wind patterns which have also prevailed generally for the past several months.

The vertical thermal structure in the eastern North Pacific also reveals several factors which are believed to be important in the marine environment affecting the distribution and availability of albacore. Vertical temperature sections based on expendable bathythermograph (XBT) drops made

from Merchant Ships[1] traveling between Hawaii and San Francisco show that the heat content[2] in the upper 300 feet (100 meters) of the ocean over most of the area between Hawaii and 500 miles of the U.S. west coast is greater than normal. This greater heat storage should allow early and/or extensive ocean warming in the coming season. Abrupt changes in upper layer isotherms observed on XBT sections and changes in surface salinity measured at XBT stations may be used to indicate the boundaries of the Transition Zone between North and Central Pacific waters. Recent albacore research findings indicate that the Transition Zone is important in influencing the shoreward migration of albacore. XBT sections and surface salinity observations made during spring 1975 show that the Transition Zone has shifted nearer to San Francisco, closer to shore and slightly further north, than in earlier years and that the boundaries are well-defined. These conditions indicate that the major portion of albacore migration will be to northerly waters.

According to information supplied by the Long Range Prediction Group of the National Weather Service, the stronger-than-normal high pressure system which has dominated the eastern North Pacific for a number of months is expected to move northeast forming a high-pressure ridge extending towards the Pacific Northwest. This pressure ridge will tend to divert large-scale storms well to the north of the Canadian-U.S.border. Ocean warming should occur under and west of the pressure ridge extending the anomalously warm sea surface temperature conditions found offshore into the Pacific Northwest region. The predicted sea level atmospheric pressure pattern suggests that there will be a tight pressure gradient immediately off the coast, especially off central Oregon to central California, where a narrow band of strong winds will produce strong upwelling and pockets of cool water. Sharp thermal gradients that develop between the upwelled water and the warm offshore waters should be very favorable to the concentration of albacore schools.

## HISTORICAL TRENDS IN ALBACORE CATCHES

Seasonal landings of albacore tuna for the Pacific West Coast (U.S. and Canada) for the period 1938-1974 are shown in Plate 1. This chart does not take into account changes in fishing effort or efficiency. West Coast landings for the 1974 season, based on preliminary information, were approximately 53.5 million pounds. This is 30% higher than the 1973 total catch of 40.2 million pounds and about 10% higher than the 1964 to 1973 average of 49.3 million pounds. The higher catch in 1974 was in part due to 1) good weather conditions for relatively long periods off the coast of Washington and British Columbia, 2) allowing fishermen to "stay on fish" which were generally well-concentrated there and 3) unusually good livebait fishing off the Pacific Northwest during late August and September.

The percentage of the total West Coast catch taken north of San Francisco for the period 1938-1974 is shown in Plate 2. The percentage north-south distribution of catch reflects the large shifts in the location of the centers of the albacore fishery which have taken place over the past 36 years. During 1974, about 85% of the catch was taken north of San Francisco and 15% south.

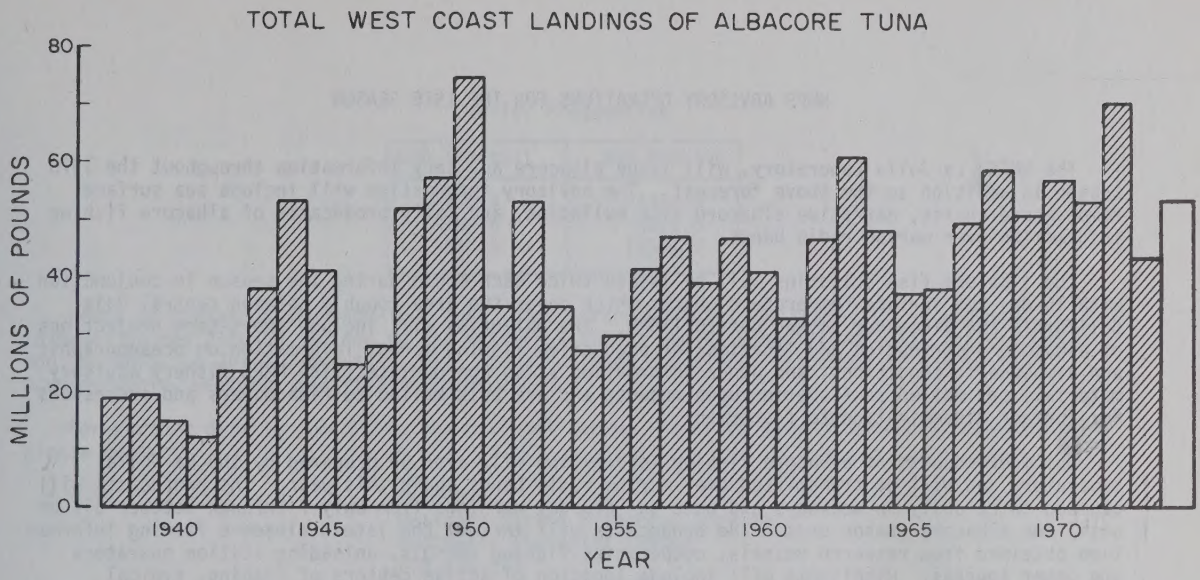
Albacore landings by states for recent years are as follows:

Albacore Landings by State for 1970-1974

| State | 1974* | 1973* | 1972 | 1971 | 1970 |
|---|---|---|---|---|---|
| California | 8.3 | 8.0 | 21.0 | 36.1 | 29.9 |
| Oregon | 25.2 | 16.3 | 23.1 | 8.4 | 21.8 |
| Washington | 17.4 | 13.1 | 16.2 | 5.3 | 4.4 |
| British Columbia | 2.6 | 2.8 | 7.6 | 3.7 | 1.6 |
| Total | 53.5 | 40.2 | 67.9 | 53.5 | 57.7 |

*preliminary

[1]Cooperative NMFS-NORPAX Ship of Opportunity Program.
[2]Provided by J.F.T.Saur, presently of the Scripps Institution of Oceanography, NORPAX.



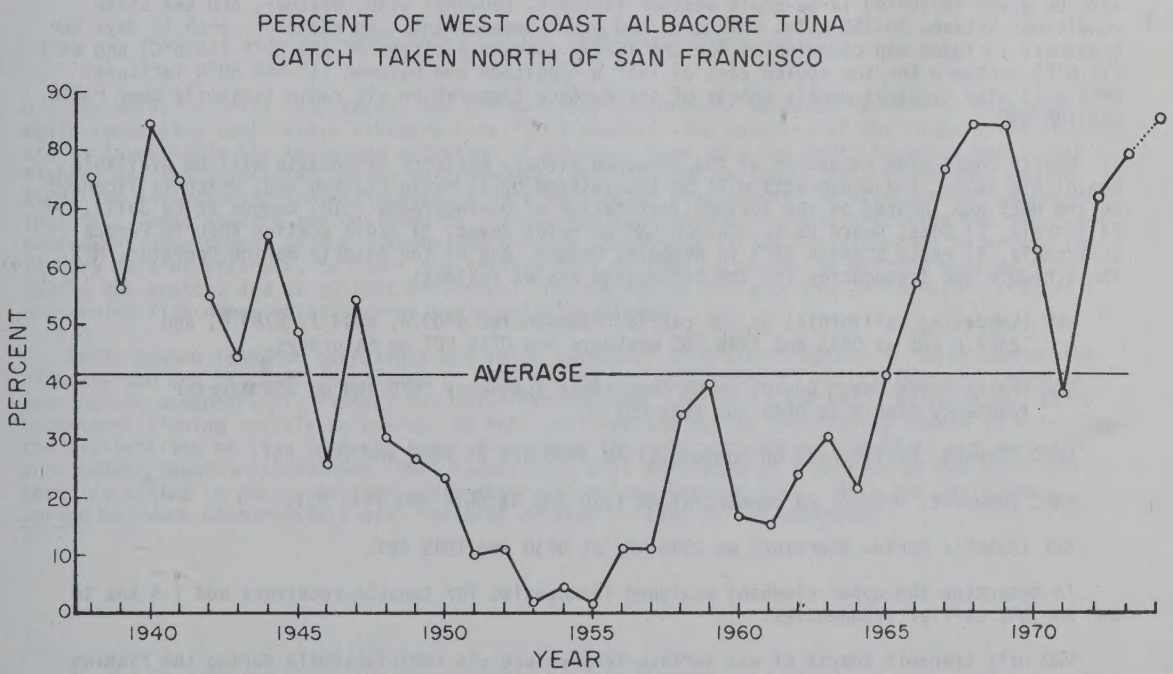




PLATE 1.— Top graph: Total west coast landings of albacore tuna in millions of pounds, 1938–1974.

PLATE 2.— Bottom graph: Percent of west coast albacore tuna catch taken north of San Francisco, 1938–1974.

## NMFS ADVISORY OPERATIONS FOR THE 1975 SEASON

The NMFS, La Jolla Laboratory, will issue albacore advisory information throughout the 1975 season in addition to the above forecast. The advisory information will include sea surface temperature charts, narrative albacore fish bulletins, and daily broadcasts of albacore fishing information over marine radio bands.

The albacore fish bulletins will be issued twice each month during the season in conjunction with 15-day sea surface temperature charts which cover the area roughly between central Baja California and Vancouver Island out to 135°W. The bulletins will include short-term projections of albacore distribution and locations of productive fishing areas, information on oceanographic and atmospheric conditions, and other information as is appropriate. The NMFS fishery advisory materials are mailed to fishermen upon request and are bulk-mailed to fish buyers and processors for further dissemination to fishermen.

Daily broadcasts of albacore fishing information will also be prepared by the La Jolla Laboratory and will be transmitted over marine radio bands again this year. The broadcasts will be made twice daily on weekdays and once on Saturday mornings from July 7 through October 31, or until the albacore season ends. The broadcasts will include the latest albacore fishing information obtained from research vessels, cooperating fishing vessels, unloading station operators and other sources. Highlights will include location of active centers of fishing, typical fishing scores, size of fish, sea surface temperature and subsurface temperature information when available, and other information as appropriate. Sport boat albacore fishing activity will also be included. A weather and sea state summary prepared by the National Weather Service will also be given including large-scale weather features, regional wind, weather, and sea state conditions between 20-250 miles offshore, and storm development. In addition, each 15 days the broadcast includes map coordinates for the 15-day average position of the 60°F (15.6°C) and 64°F (17.8°C) isotherm for the region east of 135° W longitude and between 15° and 50°N latitude. NMFS will also transmit weekly charts of sea surface temperature via radio facsimile over radio station WWD.

Nearly coast-wide reception of the albacore fishery advisory broadcasts will be available again this year. The broadcasts will be transmitted by 1) radio station WWD, which is licensed to the NMFS and located on the Scripps Institution of Oceanography (SIO) campus at La Jolla, California, 2) Coast Guard radio station NMC at Point Reyes, 3) radio station KRED in Eureka, California, 4) radio station KNPT in Newport, Oregon, and 5) the Astoria Marine Operator, KFX. The schedule and frequencies for the broadcasts are as follows:

WWD (La Jolla, California) on SSB carrier frequencies 4409.4, 8644.1, 8789.6, and 12424.5 kHz at 0615 and 1745 PDT weekdays and 0715 PDT on Saturdays.

NMC (Point Reyes Coast Guard) on AM compatible frequency 2670 and on SSB carrier frequency 8760.8 at 0645 and 1945 PDT.

KRED (Eureka, California) on commercial AM 1480 kHz at 0605 and 2005 PDT.

KNPT (Newport, Oregon) on commercial AM 1310 kHz at 0615 and 1915 PDT.

KFX (Astoria Marine Operator) on 2598 kHz at 0630 and 1945 PDT.

To determine the upper sideband assigned frequencies for tunable receivers add 1.4 kHz to WWD and NMC carrier frequencies.

WWD will transmit charts of sea surface temperature via radiofacsimile during the fishing season for the area of the albacore fishery on upper SSB carrier frequency 8644.1 kHz. Broadcasts are being made at 1000 PDT on Fridays.

The success of the albacore advisory program depends on the input of timely, first-hand information from fishermen at sea, as well as from dock operators and processors. Fishermen are encouraged to report oceanographic, weather, and fishing information. As a channel of communication for such information, radio station WWD will operate the following voice single sideband frequencies and schedules.

Carrier Frequencies

| WWD Transmit | WWD Receive |
|---|---|
| 4409.4 | 4410.8 |
| 8789.6 | 8255.6 |
| 13147.5 | 12368.5 |

Hours of operation are 0600-1800 local time during weekdays and 0800-1700 on weekends. Information may also be radioed to the Western Fishboat Owners Association, call letters WHG, and the NMFS, La Jolla Laboratory, will accept collect calls from fishermen at sea to report oceanographic, weather, and fishing information.

For further details concerning the National Marine Fisheries Service albacore information, please contact:

Director
National Marine Fisheries Service
Southwest Fisheries Center
P.O.Box 271
La Jolla, California 92038

Telephone (714)453-2820

## JOINT NMFS-AFRF ALBACORE RESEARCH STUDIES FOR 1975

The NMFS, La Jolla Laboratory, and the American Fishermen's Research Foundation this year are again conducting cooperative albacore tuna field studies. The purposes of the cooperative studies are to investigate the shoreward migration of albacore tuna into the North American West Coast fishery and the associated marine environmental factors that influence this migration, and to study the early-season and within-season distribution of albacore in the offshore and nearshore regions. These studies are designed to improve our knowledge of factors affecting the onset and subsequent development of the fishery, to examine the possibilities for fishermen to extend the fishery farther offshore, to start the fishery earlier than is usual, to better "stay on fish" during the season, and to collect biological information on the albacore for research studies concerning fish-ocean relationships and population dynamics.

Early season research operations are being conducted in offshore waters by three commercial jigboats and one baitboat on charter to AFRF and by the NMFS research vessel Townsend Cromwell and include oceanography, fishery biology, fish tagging, and fish scouting. In addition, three commercial fishing vessels on charter to AFRF will operate during the fishing season to determine the availability of fish in areas other than where the main portions of the fleet are operating and conduct tagging operations. NMFS technicians will be placed on a portion of the AFRF charter boats to assist in making oceanographic observations and tagging fish. Also the David Starr Jordan may work cooperatively with the AFRF charter vessels during September.

# Sea Surface Temperature and Environmental Conditions

R. EVANS AND F. MILLER

## Eastern North Pacific

Sea surface temperatures warmed over the entire eastern North Pacific during May except for isolated areas off Baja California between 20° and 25° N and 115° to 125° W and on the coast near San Francisco. The area of greatest warming was centered near 42° N and 137° W where temperatures increased 2.6° F (1.4° C) from April to May. The heating of surface waters in this area caused the band of abnormally warm water evident in the central eastern North Pacific in April to spread further to the north and east in May. The eastern boundary moved from 137° W to 134° W and the northern boundary from 44° N to 49° N. Generally, the anomaly patterns present in April tended to deepen and consolidate in May. The band of warmer water previously mentioned now extends from Luzon (see western North Pacific) in an east-northeasterly direction across the entire North Pacific to 134° W. Cold anomalies on either side of this band have deepened during the past month and are up to 5° F (2.8° C) colder near 18° N and 120° W in May.

Barometric pressures ran below normal through most of the eastern North Pacific in May by up to 6 mb. Exceptions to this occurred south of 25° N and from the coast of Oregon and Washington out to 138° W where pressures were $\geq$1 mb above the long-term mean. The below normal pressures in the area of the Aleutian low coupled with the weak ridge off Oregon and Washington produced wind speeds of from 2 to 4 knots above the long-term mean in an area north of 45° N and west of 135° W. Winds in this area also had a stronger-than-normal southerly component due to the effects of this same weak ridge. The subtropical high center near 33° N and 133° W in May was compressed against the west coast of North America. This caused winds west of 140° W between 30° and 35° N to also have a stronger-than-normal southerly component. The higher winds associated with the intensification of the Aleutian low appear to have caused the deepening of the negative sea surface temperature anomaly located north of 50° N in Figure 5.

## Western North Pacific

Sea surface temperature patterns in the western North Pacific continued near the normal in May with deviations from the long-term mean being $\leq$3° F (1.7° C) in most areas. The one exception to this being a small area off northern Honshu and southern Hokushu where temperatures were up to 5° F (2.8° C) colder than the long-term mean for May. Temperature anomalies for May were somewhat stronger than in April and with this came clearer definition of the anomaly field. A broad band of generally warmer water extended from the island of Luzon in an east-northeasterly direction across the entire western North Pacific (Figure 6). This band ranged from 5° to 15° in width and in the western North Pacific it extended north to cover almost the entire North Pacific west of 135° E. Immediately adjacent to this band of warm water and to the north was a band of colder water of comparable size that extended eastward from 135° E across the entire western North Pacific. North of 40° N anomaly patterns appeared stronger and more varied reflecting the influence of the warm Kuroshio current.

## Eastern Tropical Pacific

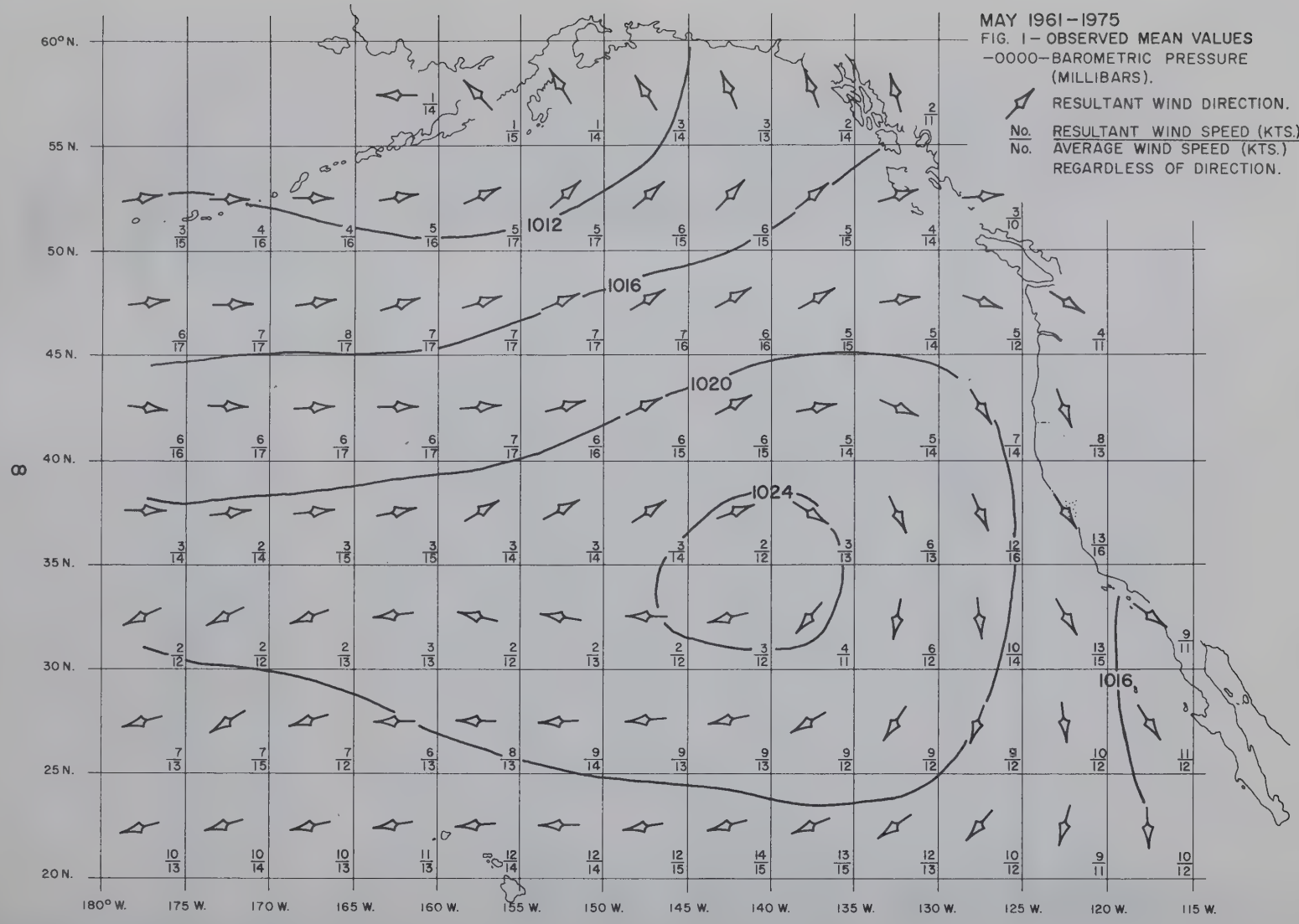
By May of each year sea surface temperatures (SST) in the northern hemisphere begin to show significant increases in most areas. In particular, temperature increases greater than 2° F (1.1° C) occur in the Gulf of California, along the west coast of Mexico to 15° N, and in the Gulf of Panama. In the southern hemisphere seasonal rates of cooling are usually accelerated as much as 2° to 4° F (1.1° to 2.2° C) in the surface layers of the Peru Current and in its equatorial extension westward from Ecuador to 110° W. In these areas persistent southeast trade winds help to increase upwelling and ocean mixing. Elsewhere in the southern hemisphere the seasonal cooling rate in the surface layers is slight between the equator and 25° S.

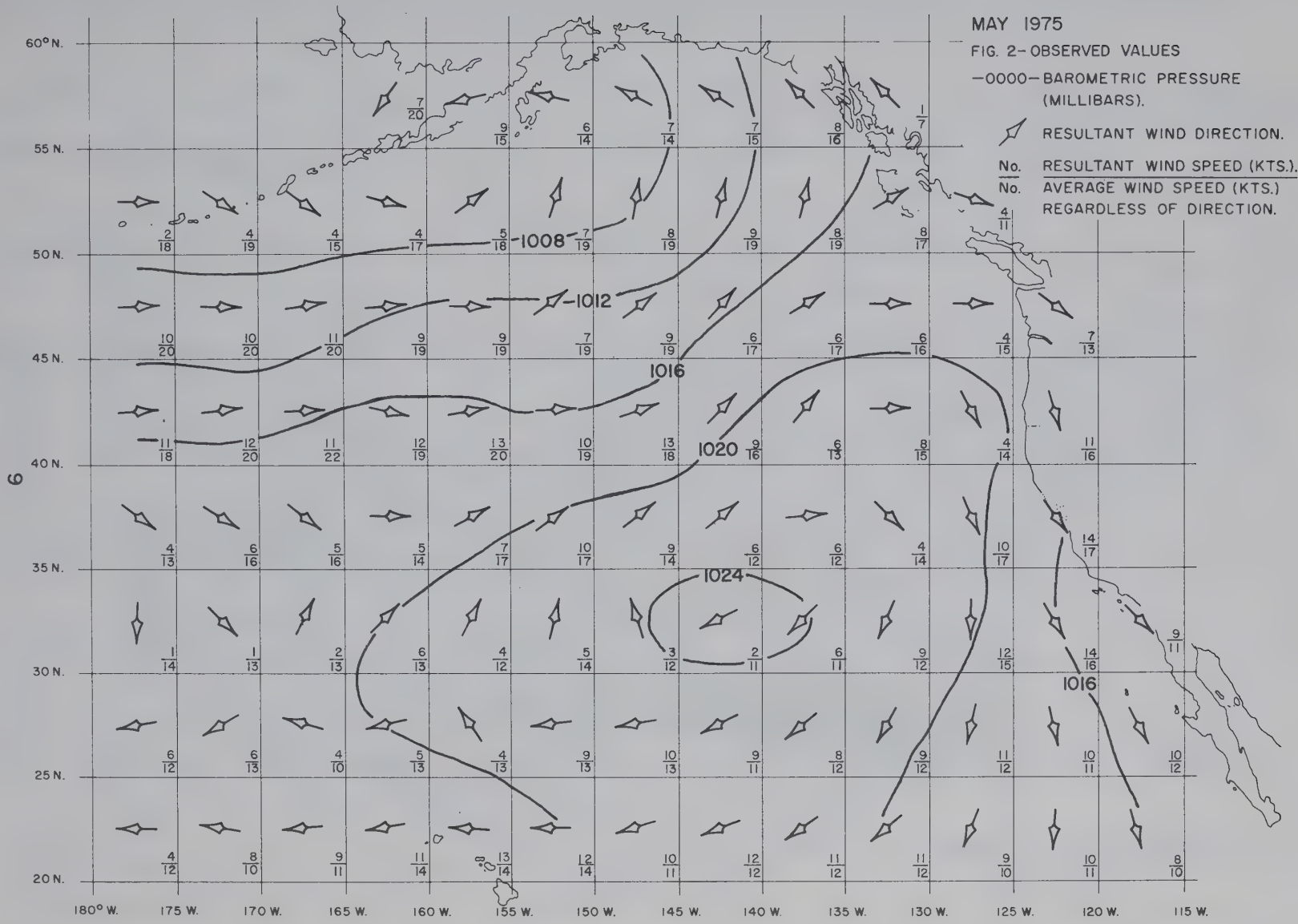
During May 1975 the most significant changes in the SST from April 1975 occurred along the equator and in the southern hemisphere north of 20° S. East of 100° W between the equator and 5° S the SST decreased at a rate in excess of the normal seasonal cooling. In April 1975 temperatures in this area were 2° to 4° F (1.1° to 2.2° F) above normal, but by May temperatures cooled rapidly. To the north of the equator from the Galapagos Islands eastward temperatures remained above normal. Apparently the rapid surface cooling between Ecuador and the Galapagos in May was due, in part, to heavier cloud cover and stronger southerly surface winds than normal along the coast. Farther south along the coast of Peru upwelling in the Peru Current was diminished, particularly south of 10° S and westward from 80° to 85° W.

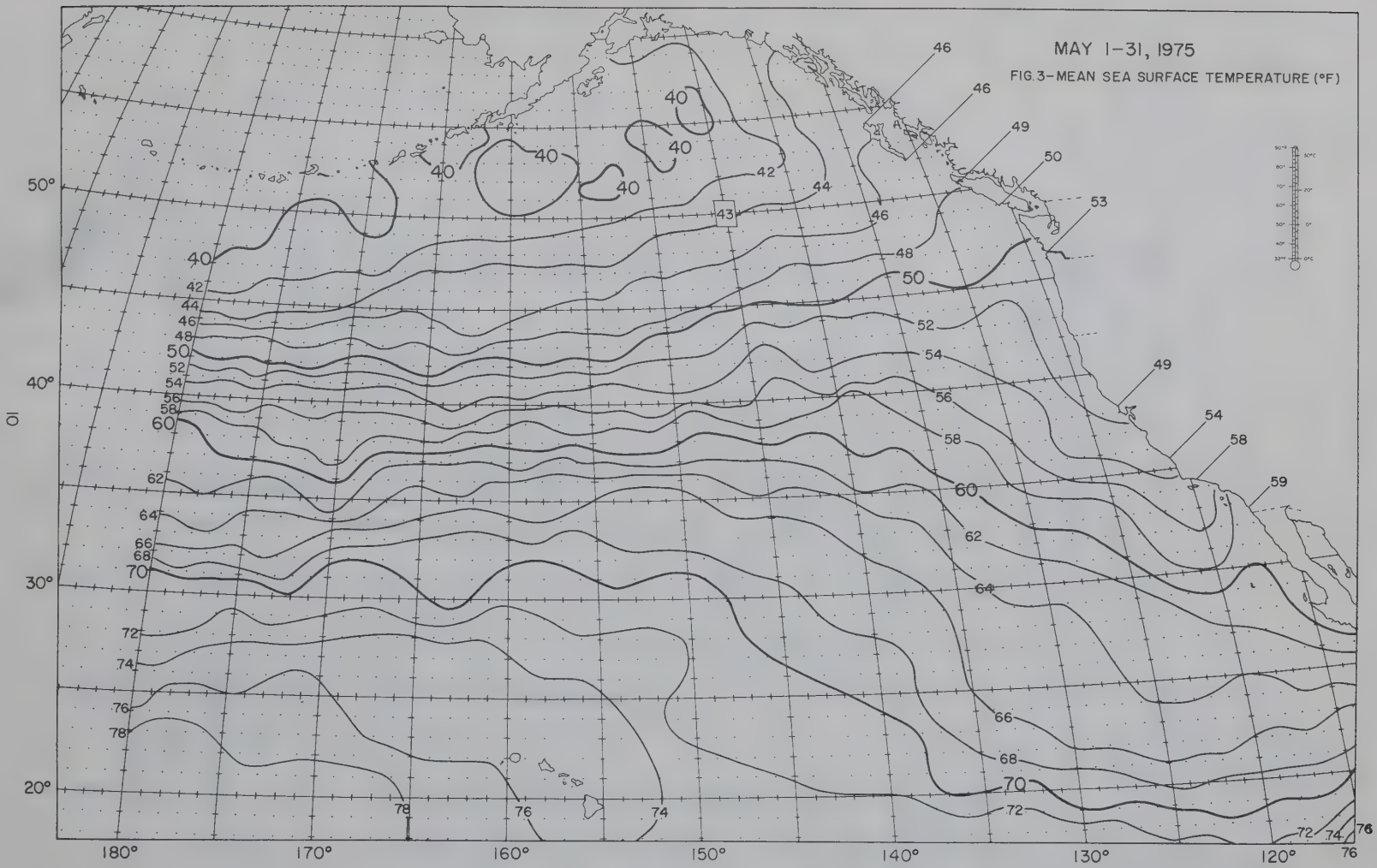
During May 1975 the southern high pressure center (normally centered near 30°S, 90°W) was shifted out of position occassionally as weak weather fronts moved eastward toward the coast of southern Peru. As a result, lower-than-normal pressure persisted off the coast of Peru and northern Chile during May, and the southeast trades south of 10° S were frequently below normal also.

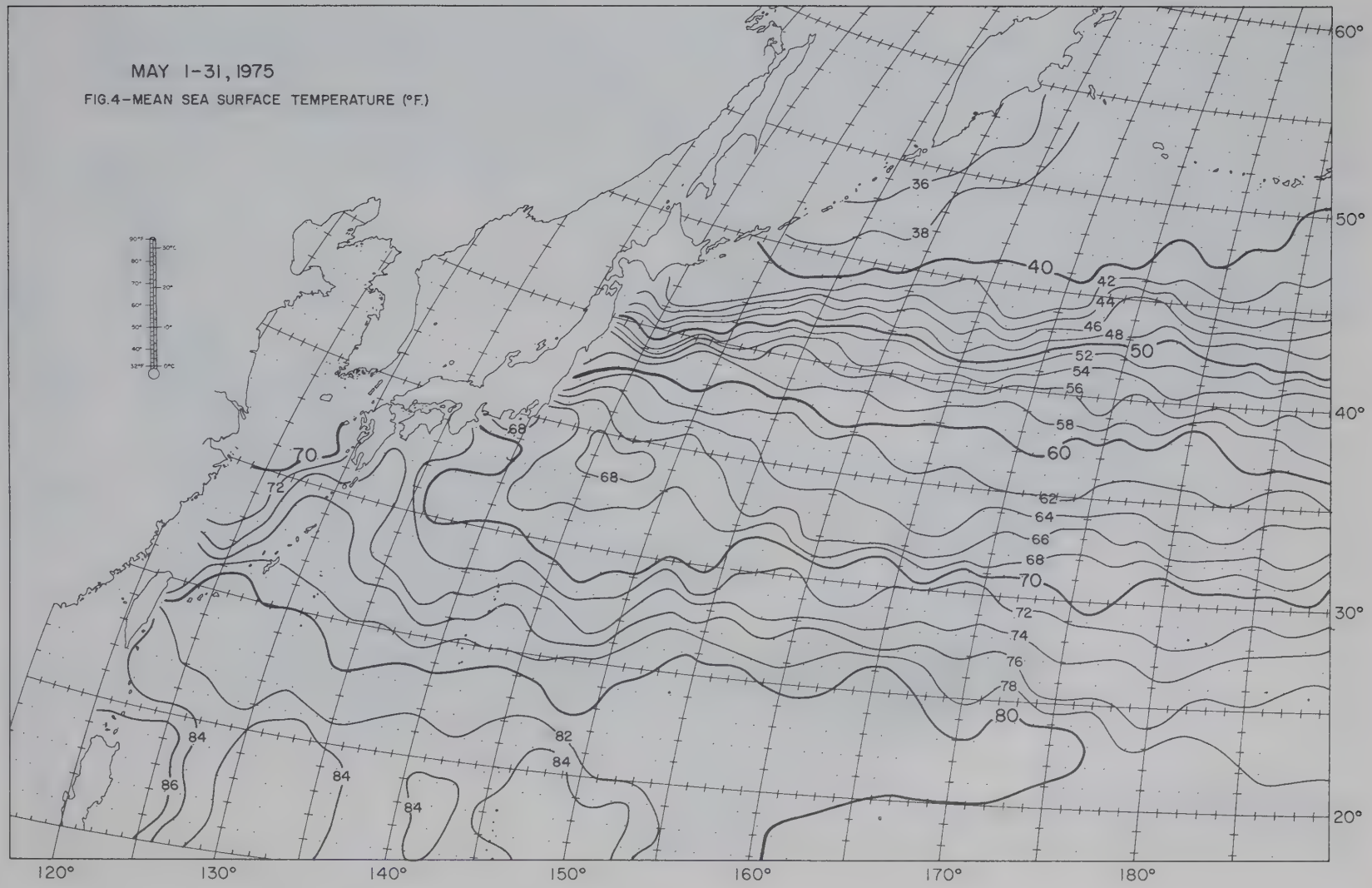
The reader is reminded that the analyses in Figures 8 and 9 and the discussion herein do not apply to the near shore areas, especially along the coast of South America. Because only a few commercial ships, the R/V Melville (University of California, San Diego) and the R/V Moana Wave (University of Hawaii),sent in reports which were available, Figures 8 and 9 show the SST and deviations from normal no closer than 50 miles from the coastline. The data available do not indicate that El Niño conditions are developing rapidly off the coast of South America. It is not unusual during the southern fall (northern spring) for surface warming to occur periodically in some equatorial areas east of 90° W. However, the warming trend over the southern Pacific Ocean, which has been in progress for several months, indicates that the eastern tropical Pacific Ocean should be closely monitored for signs of continued warming, especially after June 1975.

In the northern hemisphere, temperatures south and west of Baja California remained below normal. The cooler water has persisted off Baja for many months. As a result most tropical tuna fishing has been restricted to areas south of 23° N. In the eastern tropical Pacific between the equator and 20° N, fishing has been irregular and slow in those areas where temperatures were above 85° F (29.4° C). In these warm tropical waters chubascos and tropical storm Agatha developed in May near 10° N between 90° W and 105° W. West of 120° W in the northern hemisphere seasonal warming was slightly above normal. Lighter northeast trades and good weather improved tuna fishing conditions from 5° to 15° N and west of 120° W. Also, the surface temperature increased about 2° F (1.1° C) in fishing grounds west of 120° W.


MAY 1961–1975
FIG. 1 – OBSERVED MEAN VALUES
–0000– BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.)
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1012
1016
1020
1024
1016
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.


MAY 1975
FIG. 2- OBSERVED VALUES
—0000— BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1008
1012
1016
1020
1024
1016
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.
6


MAY 1-31, 1975
FIG.3-MEAN SEA SURFACE TEMPERATURE (°F)
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
01


MAY 1-31, 1975
FIG.4-MEAN SEA SURFACE TEMPERATURE (°F.)
36
38
40
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56
58
60
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68
70
72
74
76
78
80
68
70
72
68
84
86
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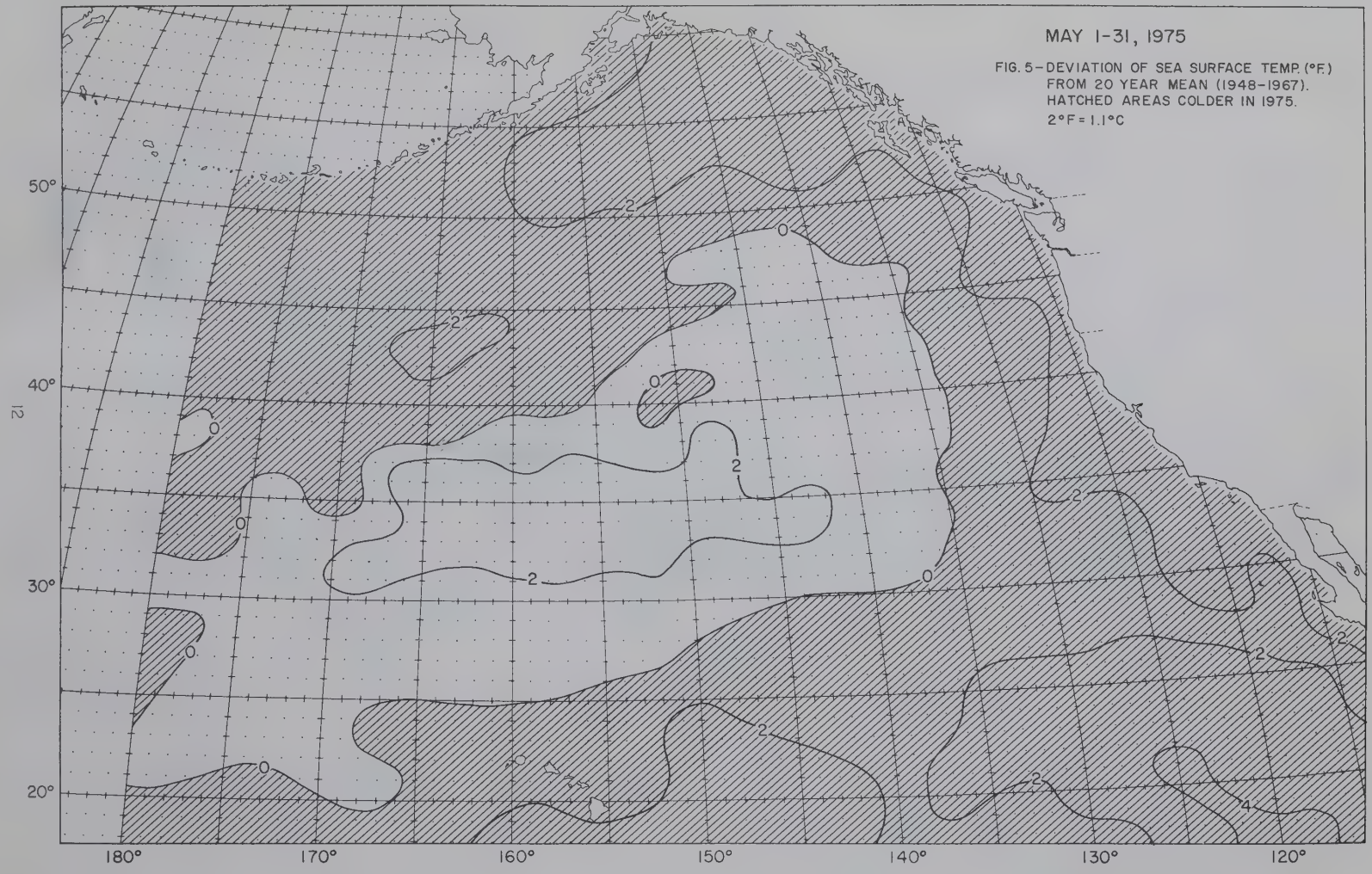
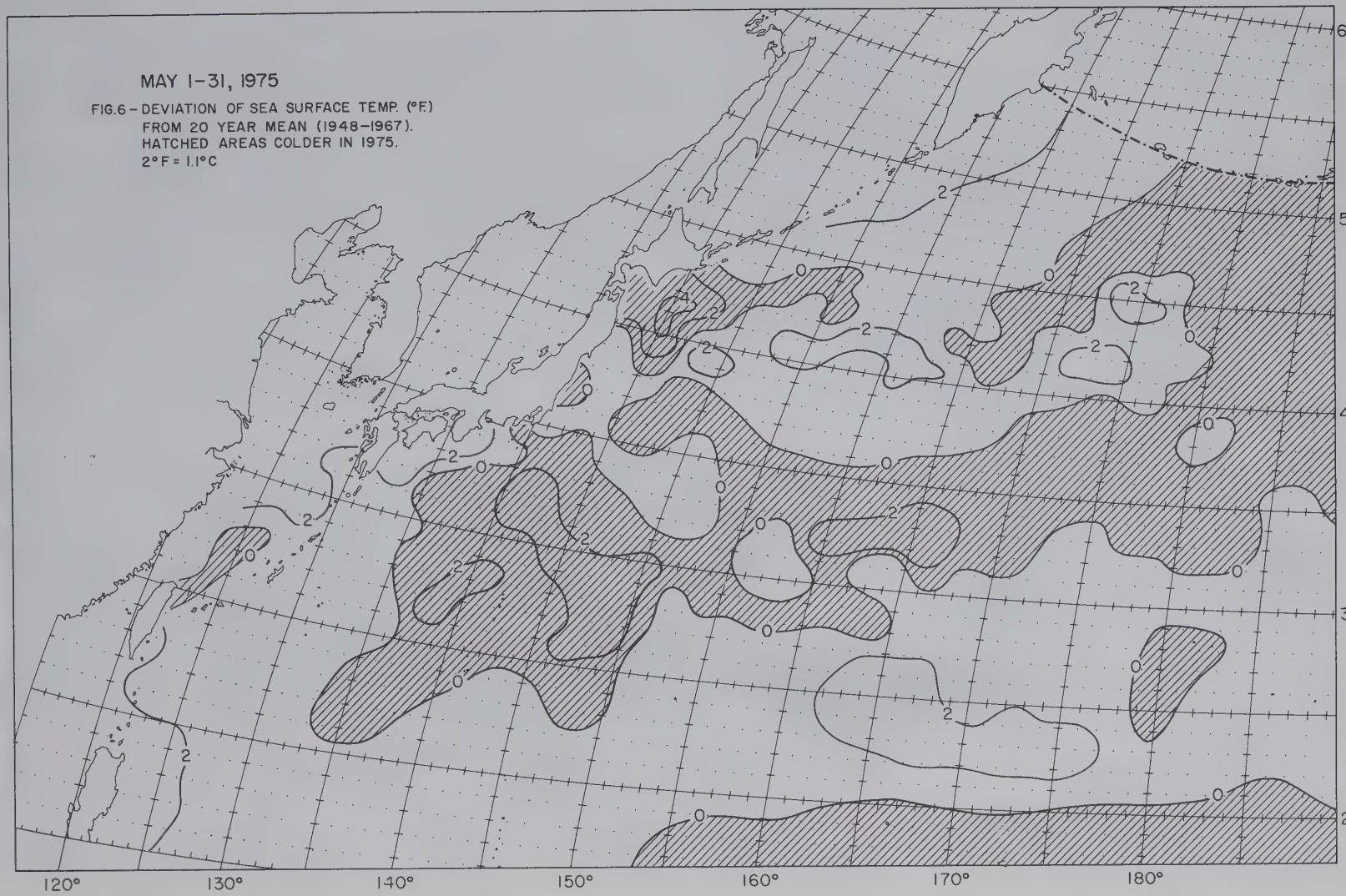
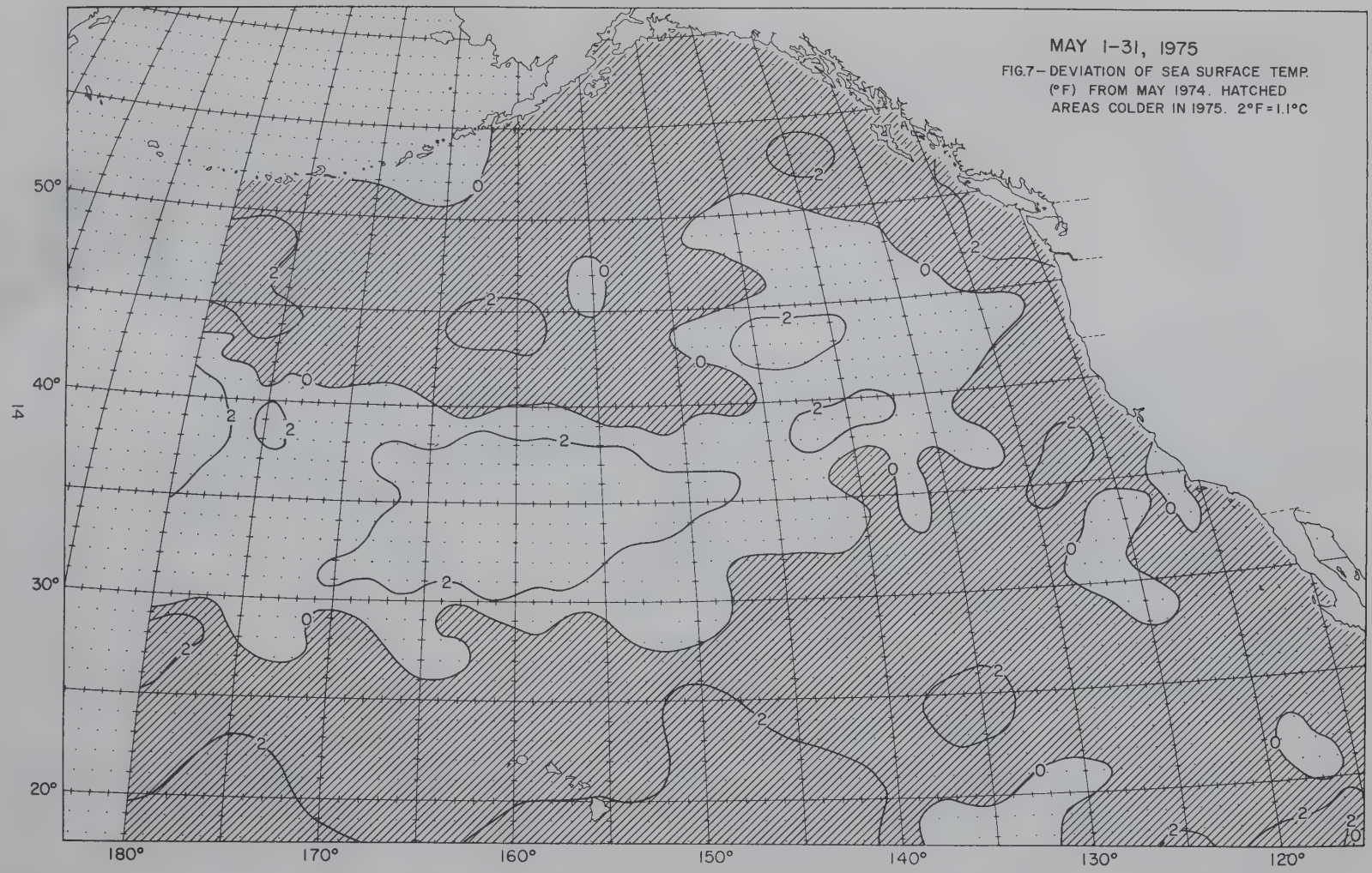
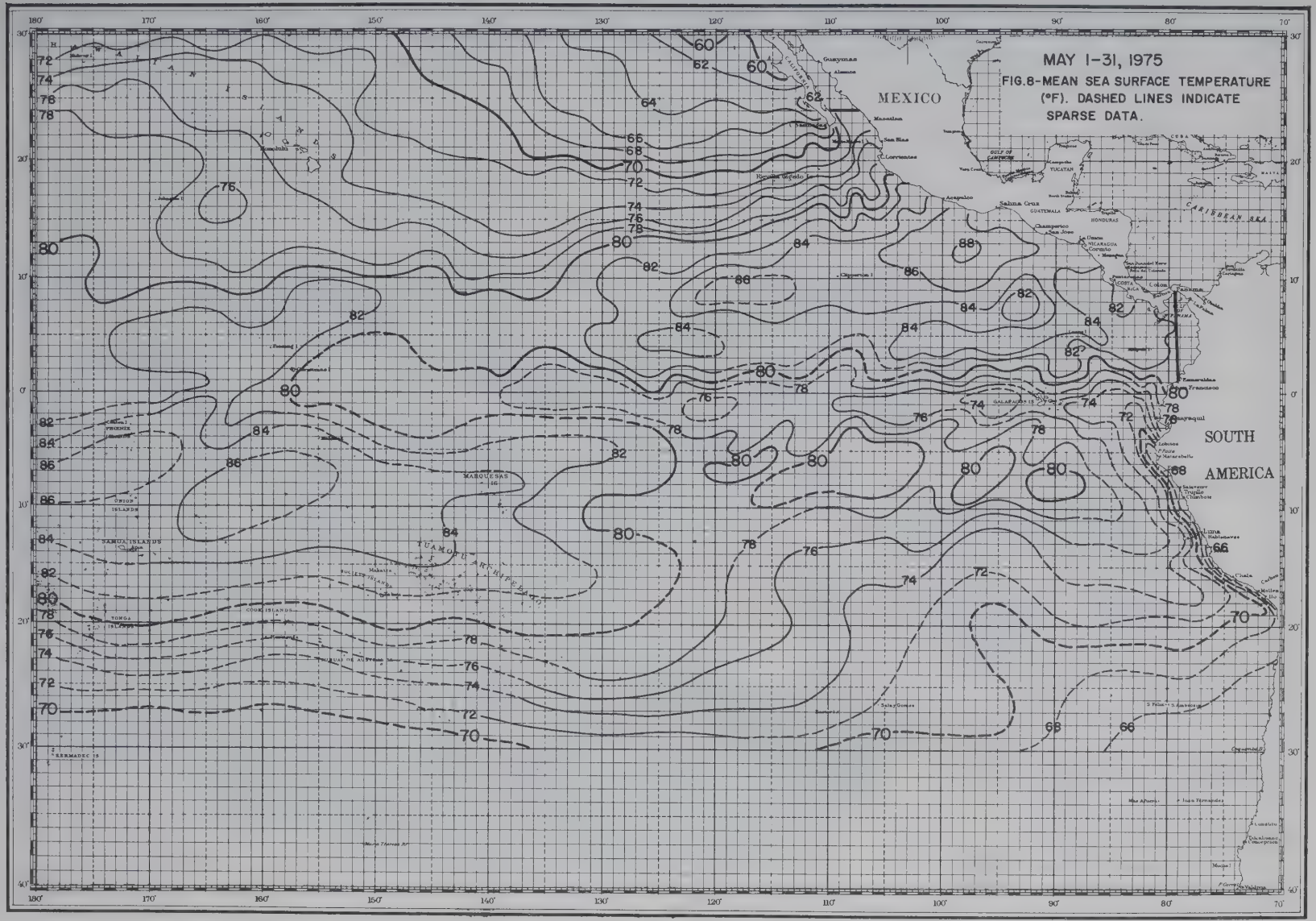
150°
160°
170°
180°


MAY 1-31, 1975
FIG. 5 – DEVIATION OF SEA SURFACE TEMP. (°F.) FROM 20 YEAR MEAN (1948–1967). HATCHED AREAS COLDER IN 1975.
2°F = 1.1°C
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
0
2
4


MAY 1-31, 1975
FIG.6 - DEVIATION OF SEA SURFACE TEMP. (°F.)
FROM 20 YEAR MEAN (1948-1967).
HATCHED AREAS COLDER IN 1975.
2° F = 1.1° C
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


MAY 1-31, 1975
FIG.7- DEVIATION OF SEA SURFACE TEMP. (°F) FROM MAY 1974. HATCHED AREAS COLDER IN 1975. 2°F = 1.1°C
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
0
2


MAY 1-31, 1975
FIG.8-MEAN SEA SURFACE TEMPERATURE (°F). DASHED LINES INDICATE SPARSE DATA.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
GUATEMALA
HONDURAS
NICARAGUA
COSTA RICA
PANAMA
COLOMBIA
ECUADOR
PERU
GALAPAGOS IS.
MARQUESAS IS.
TUAMOTU ARCHIPELAGO
COOK ISLANDS
SAMOA ISLANDS
TONGA ISLANDS
FIJI IS.
BERMADEC IS
EASTER I.
JUAN FERNANDEZ IS.
Guaymas
Mazatlan
San Blas
Acapulco
Salina Cruz
Champerico
Lima
Callao
Guayaquil
Panama
Cristobal
Colon
Salvador
Trujillo
Chimbote
Chala
Mollendo
Arica
Iquique
Valparaiso
Juan Fernandez
Pascua
Marquesas
Tuamotu
Society Is.
Tahiti
Samoa
Tonga
Fiji
Cook Is.
Easter I.
Bermadec Is.
Galapagos Is.
Clipperton I.
Cocos I.
Malpelo I.
Gorgona I.
Gallo I.
Pitcairn I.
Henderson I.
Ducie I.
Oeno I.
Rapa
Raivavae
Rurutu
Tubuai Is.
Austral Is.
Niue I.
Manihiki
Penrhyn
Nassau I.
Suwarrow
Palmerston I.
Aitutaki
Manuae
Rarotonga
Mangaia
Atiu
Mauke
Mitiaro

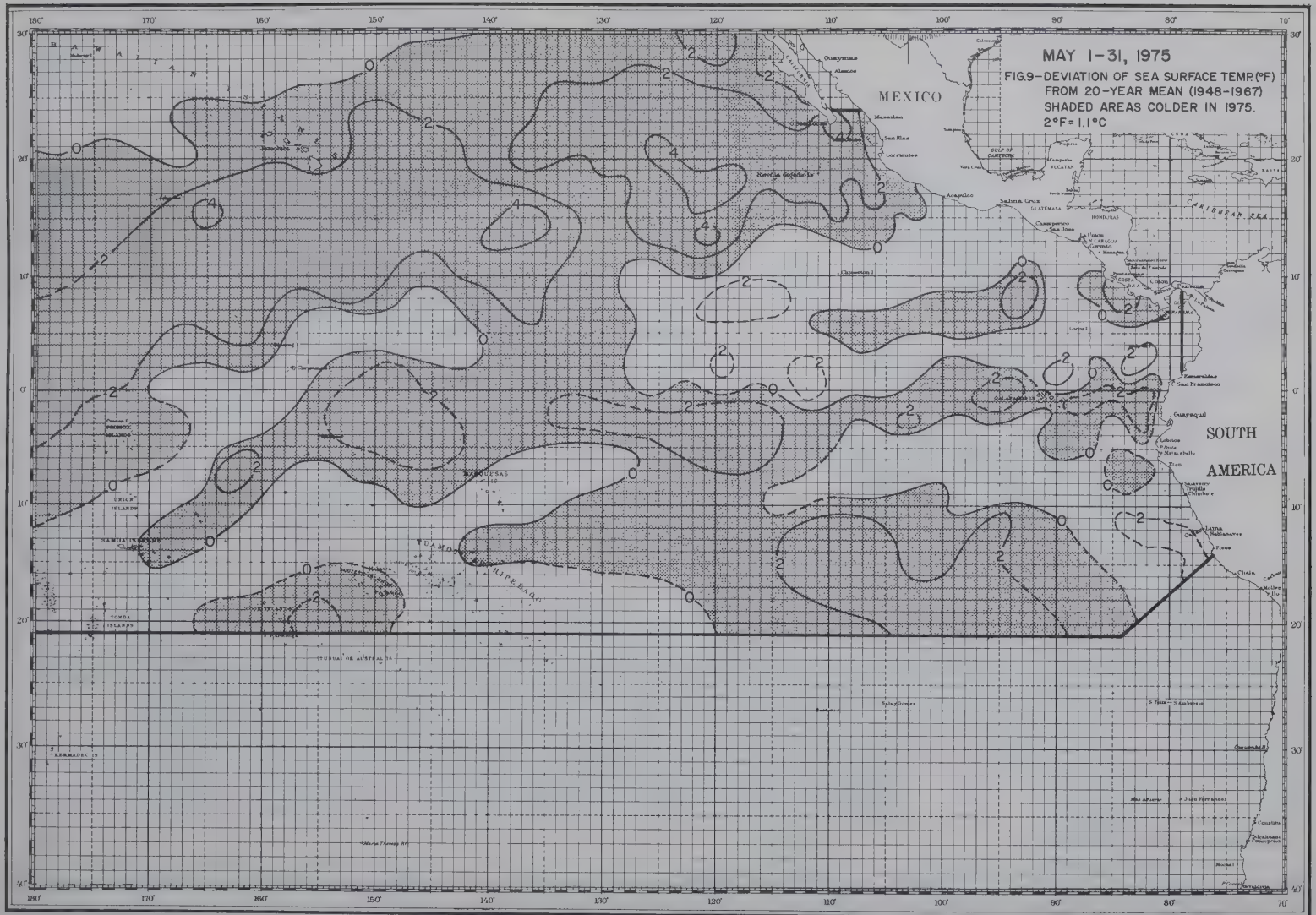
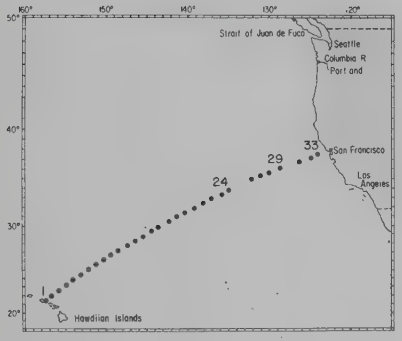
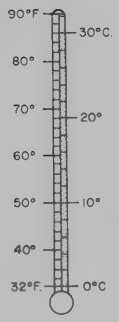

MAY 1-31, 1975
FIG.9-DEVIATION OF SEA SURFACE TEMP.(°F)
FROM 20-YEAR MEAN (1948-1967)
SHADED AREAS COLDER IN 1975.
2°F = 1.1°C
MEXICO
SOUTH
AMERICA
CARIBBEAN SEA
GUATEMALA
HONDURAS
COSTA
PANAMA
Guayaquil
San Francisco
Acapulco
Salina Cruz
Manzanillo
Guaymas
Alamos
San Blas
Corrientes
Puerto Vallarta
Chiapa de Corzo
Tapachula
Champerico
San Jose
Cristobal
Colon
Balboa
Callao
Paita
Talara
Chiclayo
Trujillo
Chimbote
Salaverry
Huacho
Chimbote
Chicama
Malabrigo
Pisco
Mollendo
Ilo
Arica
Iquique
Tocopilla
Antofagasta
Taltal
Chanaral
Caldera
Coquimbo
Valparaiso
San Antonio
Talcahuano
Concepcion
Corral
Valdivia
Mocha I.
Juan Fernandez
Mas Afuera
Mas Tierra
Easter I.
Galapagos Is.
Clipperton I.
Cocos I.
Malpelo I.
Gorgona I.
Gallo I.
Isla de Coiba
Isla Montuosa
Isla Taboga
Isla Otoque
Isla Rey
Isla Pedro Gonzalez
Isla Saboga
Isla Chapera
Isla Chapera
Isla Bayoneta
Isla Bayoneta
Isla Bayoneta

FIGURE 10



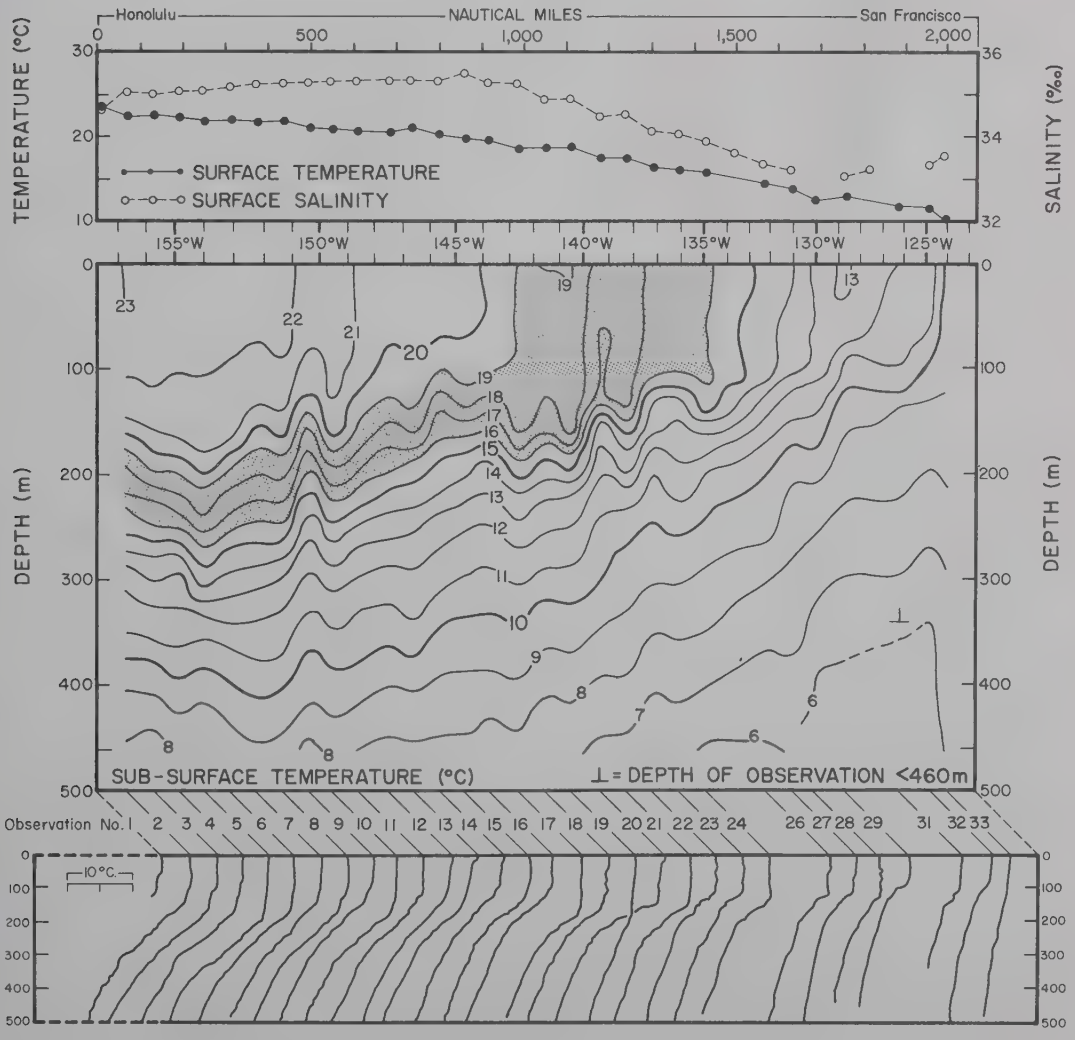




HONOLULU – SAN FRANCISCO

MAY 5-10, 1975

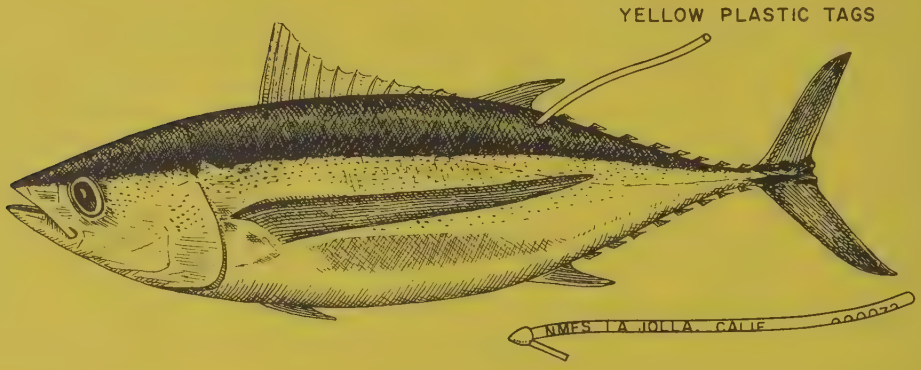
CALIFORNIAN

VOYAGE 256



# $ REWARD $

## FOR ALBACORE TUNA TAGS




THE
NATIONAL MARINE FISHERIES SERVICE WILL PAY $ 2.00 FOR EACH TAG RETURNED.

THE
AMERICAN FISHERMEN'S RESEARCH FOUNDATION WILL AWARD CASH PRIZES FOR THE NUMBERS DRAWN IN AN ANNUAL LOTTERY.

**WRITE:**

- WHERE
- WHEN
- HOW

} *FISH WAS CAUGHT*

- LENGTH OF FISH (TIP OF LOWER JAW TO FORK OF TAIL)

FORWARD TO NMFS ADDRESS ON TAG OR TO AFRF
5055 N. HARBOR DRIVE, SAN DIEGO, CALIFORNIA

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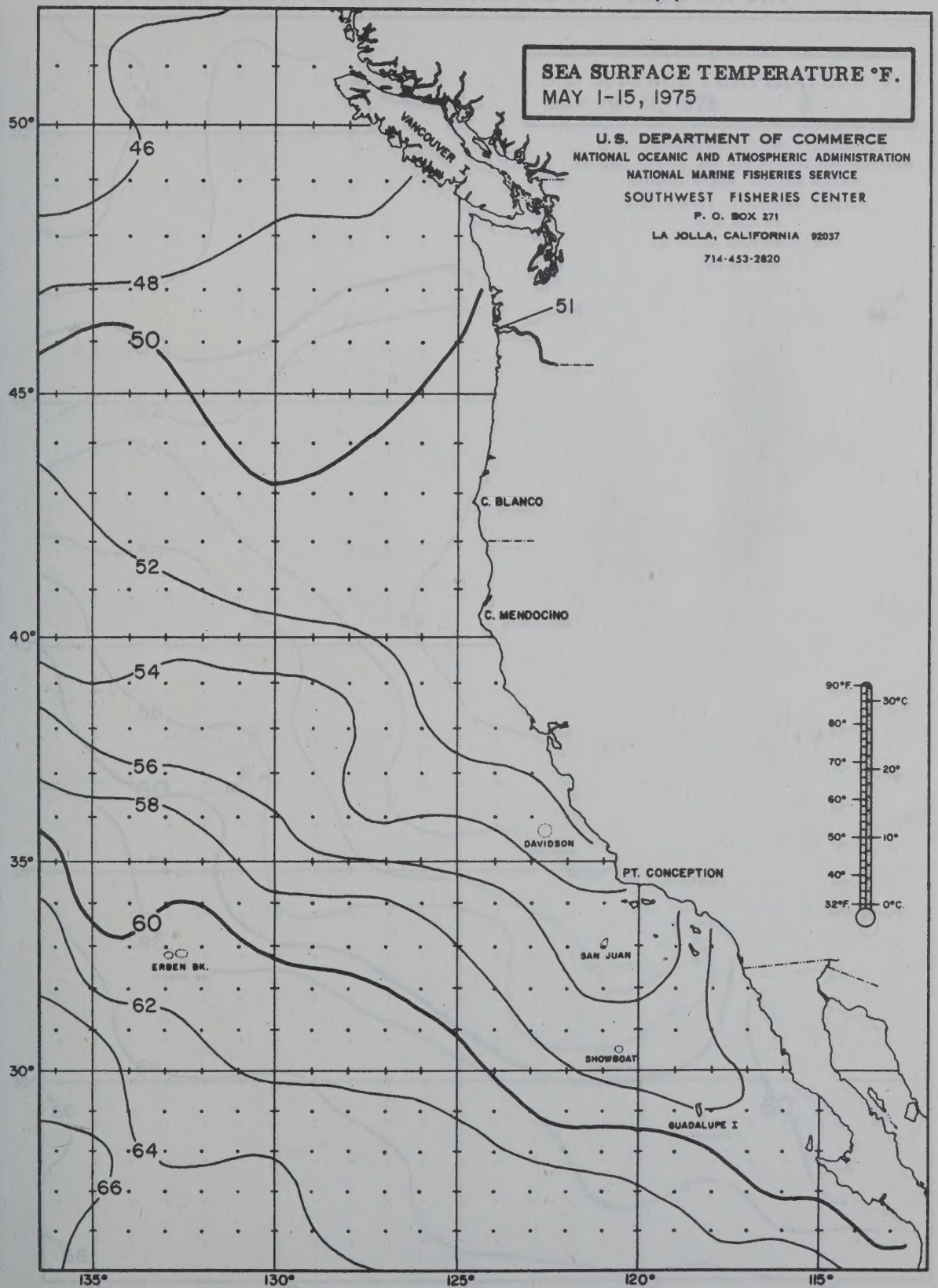
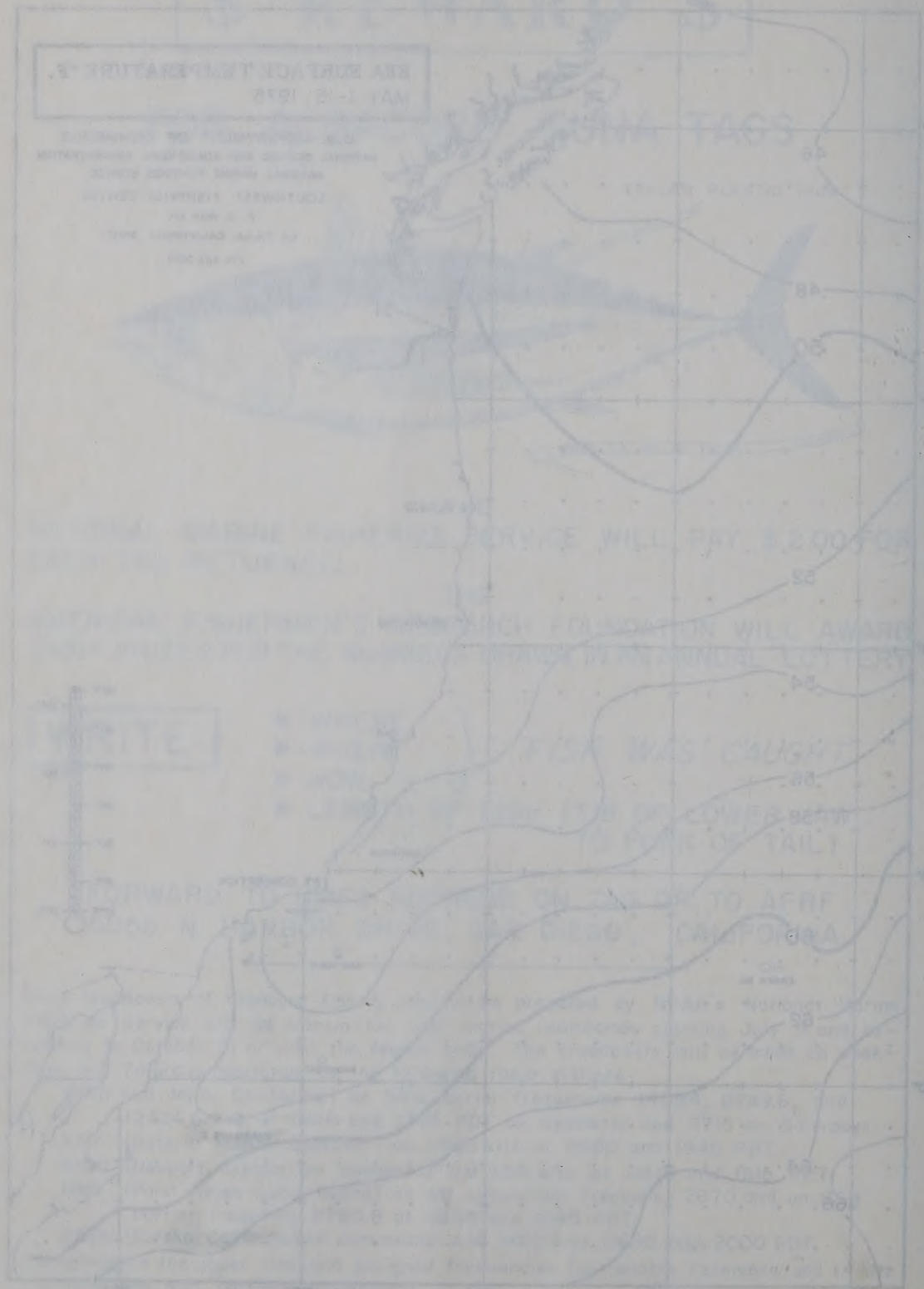
Daily broadcasts of albacore fishing information prepared by NOAA's National Marine Fisheries Service will be transmitted over marine radiobands starting July 9 and extending to October 31 or until the season ends. The broadcasts will be made on weekdays and Saturday mornings by the following radio stations:

WWD (La Jolla, California) on SSB carrier frequencies 4409.4, 8789.6, and 12424.5 kHz at 0615 and 1745 PDT on weekdays and 0715 on Saturdays.
KFX (Astoria Marine Operator) on 2598 kHz at 0630 and 1945 PDT.
KNPT (Newport, Oregon) on commercial AM 1310 kHz at 0615 and 1915 PDT.
NMC (Point Reyes Coast Guard) on AM compatible frequency 2670 and on SSB carrier frequency 8760.8 at 0645 and 1945 PDT.
KRED (Eureka, California) on commercial AM 1480 kHz 0600 and 2000 PDT.

(to determine the upper sideband assigned frequencies for tunable receivers add 1.4 kHz to WWD and NMC carrier frequencies)

# FISHING INFORMATION – supplement





# FISHING INFORMATION – supplement